

WHAT IS CLAIMED IS:

1. A CPP giant magnetoresistive head comprising:  
lower and upper shield layers with a predetermined  
5 shield distance therebetween; and  
a giant magnetoresistive element disposed between the  
upper and lower shield layers and comprising a pinned  
magnetic layer, a free magnetic layer and a nonmagnetic layer  
disposed between the pinned magnetic layer and the free  
10 magnetic layer, a current flowing perpendicularly to the film  
plane of the giant magnetoresistive element,  
wherein the pinned magnetic layer extends to the rear of  
the nonmagnetic layer and the free magnetic layer in the  
height direction, and the dimension of the pinned magnetic  
15 layer in the height direction is larger than that in the  
track width direction.
2. The CPP giant magnetoresistive head according to  
claim 1, wherein the pinned magnetic layer comprises a  
20 magnetic material having a positive magnetostriction constant  
or a magnetic material having high coercive force, and the  
end of the pinned magnetic layer exposed at a surface facing  
a recording medium.
- 25 3. The CPP giant magnetoresistive head according to  
claim 1, wherein the pinned magnetic layer has a laminated  
ferrimagnetic structure comprising a first pinned magnetic  
layer and a second pinned magnetic layer which are laminated

with a nonmagnetic intermediate layer disposed therebetween,  
and the pinned magnetic layer partially or entirely comprises  
Fe-Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic  
percent, and Cu > 5 atomic percent), Fe-Co-Cu-X (wherein X is  
5 at least one element of Pt, Pd, Mn, Si, Au, and Ag), or  
Co<sub>2</sub>MnY (wherein Y is at least one element of Ge, Si, Sn, and  
Al).

4. The CPP giant magnetoresistive head according to  
10 claim 1, further comprising an antiferromagnetic layer  
provided in the rear of the giant magnetoresistive element in  
the height direction, for pinning the magnetization direction  
of the pinned magnetic layer in the height direction.

15 5. The CPP giant magnetoresistive head according to  
claim 4, wherein the antiferromagnetic layer is an insulating  
antiferromagnetic layer comprising Ni-O or  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>,

6. The CPP giant magnetoresistive head according to  
20 claim 4, wherein the antiferromagnetic layer comprises an  
insulating antiferromagnetic comprising Ni-O or  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and  
an antiferromagnetic metal layer interposed between the  
insulating antiferromagnetic layer and the pinned magnetic  
layer.

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7. The CPP giant magnetoresistive head according to  
claim 1, further comprising large-area nonmagnetic metal  
films provided between the giant magnetoresistive element and

the lower shield layer and between the giant magnetoresistive element and the upper shield layer, respectively, so that the large-area nonmagnetic metal films are in direct contact with the pinned magnetic layer and the free magnetic layer and  
5 have larger areas than those of the pinned magnetic layer and the free magnetic layer, respectively.

8. The CPP giant magnetoresistive head according to claim 7, wherein the large-area nonmagnetic metal film  
10 disposed between the giant magnetoresistive element and the lower shield layer comprises any one of Ta/Cu, Ta/Ru/Cu, Ta/Cr, Ta/Ni-Cr, Ta/(Ni-Fe)-Cr, and Cr, and when the composition contains Cr, the Cr content exceeds 20 atomic percent.

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9. A CPP giant magnetoresistive head comprising;  
lower and upper shield layers with a predetermined shield distance therebetween; and

a giant magnetoresistive element disposed between the  
20 upper and lower shield layers and comprising a pinned magnetic layer, a free magnetic layer and a nonmagnetic layer disposed between the pinned magnetic layer and the free magnetic layer, a current flowing perpendicularly to the film plane of the giant magnetoresistive element;

25 wherein the pinned magnetic layer comprises a magnetic material having a positive magnetostriction constant or a magnetic material having high coercive force, and the end of the pinned magnetic layer is exposed at a surface facing a

recording medium.

10. The CPP giant magnetoresistive head according to claim 9, wherein the dimension of the pinned magnetic layer  
5 in the height direction is larger than the dimension in the track width direction.

11. The CPP giant magnetoresistive head according to claim 9, wherein the pinned magnetic layer has a laminated  
10 ferrimagnetic structure comprising a first pinned magnetic layer and a second pinned magnetic layer which are laminated with a nonmagnetic intermediate layer disposed therebetween, and the pinned magnetic layer partially or entirely comprises Fe-Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic  
15 percent, and Cu > 5 atomic percent), Fe-Co-Cu-X (wherein X is at least one element of Pt, Pd, Mn, Si, Au, and Ag), or Co<sub>2</sub>MnY (wherein Y is at least one element of Ge, Si, Sn, and Al).

20 12. The CPP giant magnetoresistive head according to claim 9, further comprising an antiferromagnetic layer provided in the rear of the giant magnetoresistive element in the height direction, for pinning the magnetization direction of the pinned magnetic layer in the height direction.

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13. The CPP giant magnetoresistive head according to claim 12, wherein the antiferromagnetic layer is an insulating antiferromagnetic layer comprising Ni-O or  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.

14. The CPP giant magnetoresistive head according to claim 12, wherein the antiferromagnetic layer comprises an insulating antiferromagnetic comprising Ni-O or  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> and  
5 an antiferromagnetic metal layer interposed between the insulating antiferromagnetic layer and the pinned magnetic layer.

15. The CPP giant magnetoresistive head according to  
10 claim 9, further comprising large-area nonmagnetic metal films provided between the giant magnetoresistive element and the lower shield layer and between the giant magnetoresistive element and the upper shield layer, respectively, so that the large-area nonmagnetic metal films are in direct contact with  
15 the pinned magnetic layer and the free magnetic layer and have larger areas than those of the pinned magnetic layer and the free magnetic layer, respectively.

16. The CPP giant magnetoresistive head according to  
20 claim 15, wherein the large-area nonmagnetic metal film disposed between the giant magnetoresistive element and the lower shield layer comprises any one of Ta/Cu, Ta/Ru/Cu, Ta/Cr, Ta/Ni-Cr, Ta/(Ni-Fe)-Cr, and Cr, and when the composition contains Cr, the Cr content exceeds 20 atomic  
25 percent.